IMPRESS PROJECT DECISION SUPPORT TOOL IN REAL TEST CASE SCENARIO APPLICATION

Nina Dobrinkova, Geert Seynaeve, Asen Slavev, Andriana Zlatkova

PhD Nina Dobrinkova
Institute of Information and Communication Technologies – BAS
Acad. Georgi Bonchev str. bl.2
Tel: +35929792057, Fax: +35928707273
e-mail: nido@math.bas.bg

PhD Geert Seynaeve
ECOMED bvba
Huart-Hamoirlaan 68, B-1030 Brussel
Tel +32 2 245 32 22, Fax +32 2 215 64 69
geert.seynaeve@attentia.be

Mr. Asen Slavev
Institute of Information and Communication Technologies – BAS
Acad. Georgi Bonchev str. bl.2
Tel: +35929792057, Fax: +35928707273
e-mail: shanpet@abv.bg

Ms. Andriana Zlatkova
Institute of Information and Communication Technologies – BAS
Acad. Georgi Bonchev str. bl.2
Tel: +35929792057, Fax: +35928707273
e-mail: anjito_79@abv.bg

Abstract
In the framework of the FP7 funded project under the call for Security, named IMPRESS, a large consortia with representatives from the ICT sector, along with medical doctors and state owned organizations had focus its efforts on an idea to built up a decision support tool in favor of medical teams first responding in cases of disasters. This tool is having potential to provide shortest path to the medical teams in the ambulances when it comes to localization and also provide information in the headquarters what expectations for injuries and collapsed infrastructures can be seen on the field when providing first aid to the affected people. One of the scenarios developed for test purposes under the project IMPRESS is located on the border area between Bulgaria and Greece in Kresna Gorge, where will be simulated a major earthquake plus massive flood event from Struma river which cause E-79 high speed road collapse and over 750 people with many fractures and injuries. This figures bring the Bulgarian health system in the area and the state representatives in the local government of Blagoevgrad to ask national and international help in order to save as many lives as possible. In our paper we will describe the Project DSS structure and the cross-border scenario tests and first results.

Keywords*: IMPRESS project DSS, medical decision support, disaster response*

INTRODUCTION

This paper is based on an outcomes and results planned to be fulfilled under the FP7 funded project called IMPRESS. Its main focus is to provide ICT support to the medical specialists and first responders in cases of emergency situations. There exists a huge variety in the occurrence and characteristics of major incidents. Incident management stakeholders and in particular emergency health service providers have to deal with two basic challenges: The disproportion between the needs and the available human/material resources in the response capacity and the inherent time constraints of an emergency. These critical factors play a seminal role in the decision-making process during a crisis event, which affects all levels of command & control (strategic, operational, tactical).

The drawback with the current health emergency management systems lies with the command & control operations that should coordinate the actions of the separate services and turn them into an effective, multi-faceted crisis response mechanism. IMPRESS project main goal is to improve the efficiency of decision making in emergency health operations, which will have a direct impact on the quality of services provided to citizens. This can bring to a consolidated concept of operations, to effectively manage medical resources, prepare and coordinate response activities, supported by a Decision Support System, using data from multiple heterogeneous sources.

The idea of the IMPRESS platform is to facilitate communication between Health Services (and Emergency Responders) at all levels of response and the crisis cycle with the necessary health care systems support, supervision and management of participating organizations. Where health services can become more proactive, better prepared and interoperable with other emergency response organizations. The medical emergency teams will get improved way of the integration of health care actors and volunteers with other Crisis Management stakeholders, providing also an overall competitive advantage of Crisis Management (CM-related) SMEs and large businesses in Europe. Similar kind of operational solutions are available already, but they have focus on different parts of the emergency response phases (see [1,2,3,4,5]), where medical units and available resources for better emergency response are not in the main focus.

IMPRESS PLATFORM GENERAL APPROACH

The project IMPRESS has as main output a platform that combine in its structure decision support tools and logistic information that can be of help to the medical and emergency teams operating on a field in cases of mass emergencies. The main concept in the project is the need for integrating and improving traditional approaches and conventional methods for emergency and disaster management, with the potential of modern decision support tools. Input from pre-event databases and contextual information (geographical, demographic, infrastructural, etc.) can be combined with real-time hazard & risk monitoring, remote sensing, damage and health-impact assessment as well with updated information on available (health) resources, using data fusion, modelling, mapping, visualisation and communication technology.

The development of decision support tools started from a robust conceptual framework for emergency management, a good understanding of the pathogenesis and health needs profile of different types of events and hazards, as well as a generic approach of health impact assessment. Identification of all stakeholders involved in the different phases of the management cycle, their role and responsibilities was benchmarked by a detailed analysis of the inherent limitations of existing best practise standards. Special attention was required for the involved of affected people and the communities, for vulnerable groups and ethical issues. Technological robustness and efficacy and efficiency of the developed decision making tools is in its final phase of testing and validation by usage of a specific scenarios including preparedness, emergency response and evaluation anlysis.

In an emergency situation, organization leadership and management need clear, accurate real-time information about the effect of the disaster upon human resources and the readiness status of the organization. One of the key IT elements for emergency response is the availability of decision support tools [1]. Today, the decision support in emergency situations represents a current issue that is being researched in various fields. The complexity of the problem and the corresponding incident resolution approaches, methodologies and support tools ask for intertwining knowledge out of fields such as computer science, psychology, sociology, medicine, biology, chemistry and knowledge engineering. Currently, there is neither an integrated plan nor a complex set of procedures that would unite principles, rules and regulations for emergency response operations.

Traditionally, crises have been conceptualized as having pre-impact, impact, post-impact and recovery phases. In most studies of crises uses the following simplified sequence of terms: pre-event, event and post-event/long-term recover [6]. Pre-event activities include risk assessments, mitigation and preparedness. The event may be either static, as a single point in time, or dynamic, evolving over time. Response and recovery occur during the post-event. Preparedness behaviour includes a variety of actions taken by families, households, communities, governments and emergency responders to get ready for a disaster. Preparedness activities may include devising disaster plans, gathering emergency supplies, training response teams, and educating residents about a potential disaster [7].

Preparedness is the phase of crisis management which refers to activities, programs and systems existing prior to a crisis that are used to support and enhance emergency response. They actually mitigate the risks and inhibit the threatening events to become crises. The crisis managers prepare resources including staff and equipment and develop plans of action and procedures for use when the crisis strikes, i.e. planning to provide the capability to deal with emergencies, and preparedness is the discipline which ensures an organization, or community's readiness to respond to a crisis in a coordinated, timely, and effective manner. The crisis preparedness includes, information and public awareness campaigns, education, exercises and training, early warning and emergency plans.

Preparedness of a nation's health sector requires careful consideration, from alerting to responding and addressing a crisis event. Most developing countries have a limited ability to undertake timely surveillance of a crisis and have very limited resources. Despite the challenges to crisis preparedness, experience nowadays reveals that some preparedness actions can occur with few external resources, for little or no cost. As example list of activities with no cost or minimal cost we present:

At no cost:

- Promote active multi-sector leadership to raise the visibility of health emergency issues.
- Encourage ministries to designate points of contact and spokespeople for health and crisis preparedness.
- Foster interdepartmental cooperation and coordination.
- Assess country/regional/local needs in advance of funding availability.
- Revise work practices to optimize the use of existing resources.
- Consult with United Nations lead agencies and donor representatives to identify available external resources.
- Contact potential private sector partners (Volunteer Organizations, NGO's) who can provide additional material, financial and technical support for planning and response.
- Leverage existing resources in efforts to attract operational partners.
- Contribute to emergency health services preparedness planning in the public and private sector.
- Reprogram existing funds.

At minimal cost:

- Disseminate public information on high-risk practices and low-technology public health measures suitable for home use.
- Establish regular, transparent and evidence-based communications.
- Fund targeted technical assistance to strengthen national emergency health services preparedness plans.
- Undertake desktop simulations to test emergency health services planning.
- Engage collaborating agencies in specific preparedness/response efforts.
- Stockpile essential commodities for crisis outbreak response.

In the preparation for crisis, training is an important tool to the crisis preparedness, which allows learning from responses. It must be a continual process in order to establish and maintain crisis preparedness. Training is an integral part of the crisis planning process, and when carefully attended to, is likely to yield high dividends in terms of the effectiveness of crisis response. As an added benefit, the training process can also become an important source of feedback regarding potential problems with the plan.

A number of activities are at the disposal of public authorities in the quest to ensure adequate training in preparation for crisis. These include:

- table-top exercises,
- simulations ("hot seat" exercises),
- on-site function exercises, and
- full-scale exercises.

Such activities are the very essence of crisis preparedness. Learning occurs in a "safe" environment and hence mistakes can be rectified and lessons can be learnt (in theory) as part of personal and organisational education in preparation for the "real thing". However, like all aspects of crisis preparedness, there is a tension between the need for planning and the realities of crisis management.

Exercise is an activity designed to promote emergency preparedness, test or evaluate emergency operations, policies, plans, procedures or facilities, train personnel in emergency duties, and demonstrate operational capabilities.

A tabletop exercise is a round table, open forum type of discussion in which an emergency situation is presented to the participants, where a series of questions is offered for consideration by the participants. Individual emergency response plans from communities and industrial operators are used in a discussion on how to best deal with the fictional emergency situation. Tabletop exercises for Emergency and Disaster Preparedness are, in fact, event - driven simulations of systems of behaviour of social, governance, agency and service systems. Given the fact that the main interest of Emergency Management is in the interaction of events distributed throughout societal infrastructure, such modelling supplies foundational support for design of response, procedural analysis and performance assessment.

Tabletop exercises:

- enable behaviour and resource management prior to accreditation,
- enable evaluation without disturbing active social interactions that would be expensive to disrupt and
- support risk assessment without stressing the actual limits of the system.

The training helps learning from the responses given. Typical crisis management activities include training and learning from responses to a large variety of major crises. Through learning, organizations can enrich their knowledge, and better employ it so as to enhance their capabilities. By learning from previous crisis events, organizations can create, among other knowledge assets, repositories of best practices that will be valuable in helping them manage their business crises.

The post-impact, emergency response stage of a disaster is characterized as the immediate aftermath of a disaster, typically including the first hours or days, perhaps up to one week, depending on the event. In a disaster or emergency situation, the hospitals need to be able to communicate with medical disaster response units and with other members of the emergency response community. The ability to exchange data in regard to hospitals' bed availability, status, services, and capacity enables both hospitals and other emergency agencies to respond to emergencies and disaster situations with greater efficiency and speed. In particular, it allows emergency dispatchers and managers to make sound logistics decisions - where to route victims, which hospitals have the ability to provide the needed service. The current situation can be optimal if the hospitals have Web-based tools for better logistic and units distributions. The fact is that most of the systems that are available nowadays do not record or present data in a standardized format, creating a serious barrier to data sharing between hospitals and emergency response groups. Without data standards, parties of various kinds are unable to view data from hospitals in a state or regional levels that use a different system – unless a specialized interface is developed. Alternatively, such officials must get special user accounts and toggle between web pages to get a full picture. Other local emergency responders are unable to get the data imported into the emergency IT tools they use (e.g. a 911/112 computer-aided dispatch system. They too must get a user account and visit the appropriate web page. This is very inefficient. A uniform data standard will allow different applications and systems to communicate seamlessly.

In addition a multi-agency, multi-discipline coordinated and timely response is needed to deal with a disaster or large scale incident. Although first responders have the technology to help accomplish this—in this case, preestablished and pre-programmed Shared Channels/Talkgroups in their portable radios— there are no Standard Operating Procedures (SOP's) to help guide the responder interaction and provide greater coordination through enhanced communication. As a result, interoperable communications is fragmented and action is delayed. The lack of a set of interoperable communications SOPs has been identified as the primary impediment to a timely and coordinated response.

European projects as IDIRA provide a first basis in terms of a shared (cross-organisationsl/cross-border) operational picture, system interoperability, communication means and decision support. However, they do not provide interoperable IT-solutions for coordination of isolated regions or inclusion of volunteers. IMPRESS project further develops solutions for inclusion of volunteers and utilizes up-to-date means of interactivity via smartphones and other common devices.

IMPRESS PLATFORM POINT OF VIEW FOR IMPROVEMENTS TO THE TARGETED STAKEHOLDERS

In cases of Major Incident Management and Security projects, ISO has initiated in 2001 work on relevant standards notable via a dedicated Technical Committee called "ISO/TC 223 Societal Security"(34 P-members and 17 O-members) chaired by Krister Kumlin with an ISO-secretariat led by Stefan Tangen.

ISO/TC 223 has 4 Working Groups (WG 1: Framework on Societal Security Management; WG 2: Terminology; WG 3 Command, Control, Coordination and Cooperation; WG 4: Preparedness and Continuity) and 8 major Work Items.

1. ISO/NP22300 (Fundamentals and vocabulary)
2. ISO/NP22301 (Preparedness and continuity management systems –Requirements)
3. ISO/WD22320 (Principles for command and control in resolving incidents)
4. ISO/WD 22321 (Essential information and data requirements for command and control)
5. ISO/WD22322 (Inter/intra organizational warning procedures)
6. ISO/PWI22397 (Public/Private partnerships)
7. ISO/PWI22398 (Procedures for training and exercises)
8. ISO/CD22399 (Guideline on IPOCM (incident preparedness and operational continuity)

The ISO/TC 223 Scope includes:

- International standardization in the area of societal security, aimed at increasing crisis and continuity management and capabilities through technical, human, organization, operational, and management approaches as well as operational functionality and interoperability, as well as awareness amongst all interested parties and stakeholders.
- ISO/TC 223 will work towards international standardization that provides protection from and response to risks of unintentionally, intentionally, and naturally caused crises and disasters that disrupt and have consequences on societal functions.
- The committee will use an all-hazards perspective covering the phases of emergency and crisis management before, during, and after a societal security incident.

IMPRESS take into consideration the above standards into account for all relevant aspects of the project, namely the definition of a common taxonomy, protocols and interfaces between its component, the definition of operational procedures, the development of the IMPRESS DSS to support decision makers and the necessary training procedures and models. It also verify the validity of existing standards such as HL7-RIM, CAP, EDXL-RM or recently defined emergency management standards (e.g. EDXL-TEP/TEC) through its own validation scenarios.

IMPRESS consider the above projects and products and attempt to reuse as much of the publicly available results as possible in a best-of-breed approach. The lessons learned from previous initiatives provide valuable insight into the current gaps in decision support systems and the necessary improvements for an innovative integrated DSS in the field of emergency medical response.

IMPRESS develop a specific tool, which uses the following approaches to improve on the rapidity and accuracy of contaminant source localization:

a. it will automatically interrogate hospital records to extract cases matching the suspected exposure (through the INCIMAG and WARSYS tools), and will do so continuously during the development of the crisis);
b. it will use model comparison techniques to choose the optimal model explaining current observations;
c. it will incorporate non-homogeneities in the diffusion of contaminants or in the spread of epidemics, derived from geographic analysis of the terrain;
d. it will weight expert's opinions and relevant observations from field operators and derive from them prior densities under a bayesian paradigm.

Another specific tool developed within IMPRESS, the SICKEVO module, which address physiologic trajectory assessment and forecast. The main improvements that SICKEVO presents are on the level of detail in physiology representation, and the automatic interaction with actual observations and hospital records:

a. by using publicly available data sources (e.g. NHANES), the demographic correlations between easily determined descriptors (age, sex, weight, …) and expected physiologic compensation will be determined, and the physiologic representation of a given incident victim will be 'jump-started' from expected individualized values rather than from generic population values;
b. the existing physiologic models will also be made more specific by introducing the possibility of tailoring rates of worsening or ability to improve with therapy as dependent on individualized assessment;

c. SICKEVO will use the other IMPRESS tools INCIMAG and WARSYS to access continuusly updated victim and field observations, which may impact on the expected status and rates of improvement or deterioration of each subject's physiology (e.g. by accessing just recorded vital signs of that subject, or by accessing environment temperatures in the location of a given subject).

IMPRESS tools can give the option to examine and identify what lessons have been learned with past crises. In this way, IMPRESS will use the experience of a crisis to enhance the organizations' capabilities to prevent and mitigate the effects of a similar crisis. Learning is crucial if organizations are to improve their chances of surviving the next crisis.

IMPRESS will base its process models and operating procedures on knowledge from previous experiences which could help organizations minimize uncertainty about similar business crises and help familiarize crisis managers with the difficulties they may face and need to address. In addition, IMPRESS system develop a "training component" as an integral part of the DSS and also a common training/exercise evaluation protocol which will be critical in regards to the utilization of the IMPRESS solution by experienced crisis managers.

IMPRESS aims to design an architectural framework for interoperability of disaster management tools on operational, tactical and strategic levels, by implementing novel methodologies that allow control rooms and hospitals to seamlessly share data, information and decision making in electronic format and thus forming a strong and resilient Healthcare Network. The core of the framework will be a Multi-Agency EMS and Hospital Incident Management Systems (HIMS) that will be built on existing (e.g. HL7-RIM, CAP, EDXL-RM) or recently defined standards (e.g. EDXL-TEP/TEC) with an objective to close the interoperability gaps. For instance there is a gap when information from the emergency scene may assist preparation of definitive care facilities to care for incoming patients as both EDXL and HL7 standards utilize their own "routing header" and thus an approach to the routing of payloads to and from these domains will be studied. Moreover, as standard operating procedures (SOP's) are essential to the effective application of the Incident Management System. SOP's reflect the policy of the agency regarding the implementation and use of the system. It ensures that there is an organizational-wide standardized approach to incident management. Documented SOP's provide a performance standard or indicator for personnel and a baseline for critiques and the review of incidents. IMPRESS objective is to document and electronically ingest SOP's of health emergency services into the aforementioned Incident Management Tools.

IMPRESS system is in its second year of development and some of its functionalities are still under construction, but most of the described functionalities are structured and planned as module architectures in the full system release. We will present only one of the test case scenarios, where most of the fucntionalities will be validated.

IMPRESS PLATFORM TEST CASE CROSS-BORDER SCENARIO DESCRIOPTION

Blagoevgrad Province is a region in southwestern Bulgaria. It is surrounded from four other Bulgarian provinces on north and east. On south has border with the Greek region of East Macedonia and Trace and on west its border is FYROM Macedonia. The province has 14 municipalities with 12 towns. Its principal city is Blagoevgrad, while other significant towns include Bansko, Gotse Delchev, Melnik, Petrich, Razlog, Sandanski, and Simitli.

Blagoevgrad region location

Kresnamunicipality location in Blagoevgrad region municipalities

Kresna municipality, where is located most of Kresna Gorge is one of the most vulnerable areas in Bulgaria when it comes to earthquake potential. The potential for earthquakes in the area of Kresna municipality and Kresna gorge is evaluated as very high, because Blagoevgrad region is classified as one of the most vulnerable zones in Bulgaria (see fig. 1).

Figure 1: The most vulnerable area in Blagoevgrad region for earthquakes, where Kresna municipality and Kresna gorge are. The vulnerability for earthquakes is represented with dark brown color. Lighter colors mean lower risk cited from [8].

A total of seven seismic locations have been classified on the Bulgarian territory. All of them have the potential to cause earthquakes with a magnitude of 6.5 or greater, according to the latest statistics by National Istitute of Geology Geography and Geodesy – Bulgarian Academy of Sciences [8]. Four of the seismic spots in Bulgaria actually have the capacity of causing earthquakes with a magnitude of 7 and beyond. The Kresna municipality and Kresna Gorge are located in the Southwestern Bulgaria, where that potential has been estimated for an earthquakes which may occur with magnitudes of 7-8. Last earthquake with such strength was recorded in 1904, which higher up the risk of reoccurance nowadays.

Municipality of Kresna is one of the smallest municipalities in southwest Bulgaria, with an area of 341 km^2 and a population of 5,487 inhabitants. Covers part of the Struma River and most of Kresna Gorge. It has also parts from the western spurs of North Pirin and Northeastern slopes of the mountain Maleshevska. It borders on the municipalities of Simitli, Razlog, Bansko, Strumyani and FYROM.

The town of Kresna (3,428 inhabitants), is the administrative, economic and cultural center of the municipality. Situated at 42 km south of Blagoevgrad and at 23 km northwest of the town of Sandanski. Through it passes the international road E-79 and the railway line Sofia – Kulata – Athens. Nearby is located a marble mine, where part of the population is employed.

The Kresna Gorge is a steep valley in southwestern Bulgaria formed by the Struma/Strymónas River located on both countries Bulgaria and Greece. Its catchment area is 10,800 km². It takes its source from the Vitosha Mountain in Bulgaria, runs first westward, than southward, and enters the Greek territory at the Kula village. The river flows into the Strymonian Gulf in Aegean Sea, near Amphipolis in the Serres regional unit. The river's length is 415 km (of which 290 km in Bulgaria, making it the country's fifth longest).

Kresna Gorge is located on 52 km from the Bulgarian-Greek border (Kulata-Promahon) and it is the only connection for Trans European Corridor No. 4 called Struma Motorway. The nearest towns around Kresna gorge are:

- On north: Blagoevgrad (32km) and Simitli (15km)
- On south in Bulgaria: Kresna town (9km), Sandanski (37km) and Petrich (50km)
- Further on south in Greece after the the Greek-Bulgarian border (Kulata-Promahon) are located: Seres (96km), Thessaloniki (160km) and Kavala (186km)

The municipality of Kresna and Kresna Gorge areas are densely populated, from point of view of the territory they cover. This is because of the mild climate year-round and the marble mining activities. The area has recreational spa resorts and mountain hike roads which makes it touristic area for many Bulgarians and foreigners during most of the year.

Bulgarian country emergency response structure in case of huge emergency on the Bulgarian territory the involved authorities for the response are: local Incident Commander, Mayor of municipality or Governor of a region requesting help and support and the Ministry of Health in case of a mass casualty incident. The following structures are involved for the TTx: management, organization and resource provision of health care at disaster situations and catastrophes

implemented by the Minister of Health, Chief State Health Inspector, Director of National Center for Health Provision, directors of the regional health inspections, medical and health institutions (hospitals, emergency health units, and hospices).

Management bodies that conduct activities in cases of mass emergencies that need inclusion of the medical system in case of disasters, accidents and catastrophes, have to be in close cooperation with the central and local government, the General Directorate "Fire Safety and Population Protection" (DG "FSPP") under the Ministry of Interior, Ministry of Interior, Ministry of Defense and the Bulgarian Red Cross (BRC).

Bulgarian health system has centralized structure where the biggest response hospitals in cases of emergencies are in Sofia, Varna and Burgas. Every town has either hospis with emergency center with few ambulances or if it is bigger city there is one multidisciplinary hospital.

The event that cause a major crisis in the Bulgarian- Greek cross-border area is a mix between an earthquake in Kresna Gorge and flash flooding in Struma River. The earquake trigger a massive landslide with rock-falls phenomena in Kresna Gorge. Heavy reinfall north from Kresna municipality in the last two days has risen up the Struma river level very quickly. Road damages occurs, including at the beginning of the longest tunnel in Kresna Gorge (coordinates 41°47'25"N, 23°09'28"E). High waves in the river caused motorway collapse near the tunnel. A large numbers of vehicles on the lanes are also hit by rocks falls. A big truck transporting flammable fuel explodes at the entrance of the tunnel where many cars were stopped by the landslides. The potential alert which the IMPRESS system receive is from the regional Ministry of Health Blagoevgrad where a number of calls mentioning a large number of injured people in cars on the highway, as well as a confusing report on a massive explosion at the Kresna Gorge tunnel.

The dispatching center of the fire brigade and the emergency medical services are overwhelmed by calls for assistance by passengers all along the highway.

The first arriving ambulance is blocked by on their way to the tunnel by the road collapse. They are confronted with a large number of walking injured persons escaping the site of the explosion, some of them with severe burn injuries. There are also reports of a lot of persons entrapped in their car near the entrance of the tunnel. Additional ambulances arriving at the scene get stuck in the traffic.

An advanced medical post (casualty clearing station) is set up to try to triage the walking injured, initiate treatment at the scene, and organize transport from the scene to the nearby hospital. A team of paramedics is sent towards the site of the explosion to report on the number of casualties and the severity of injuries. Given the number of trauma patients, including patient with neurotrauma, crush injuries and severe burn injuries, and because of the difficulties of road transportation to the Bulgarian hospitals (given the collapse of the road and the traffic jam), contact is made with the Greek authorities.

A crisis center is set up both in Bulgaria as in Greece, to organize transfer of the most severe emergencies, especially with neurotrauma, crush and burn injuries, to the specialist hospital departments in Petrich, Sandanski and in Thessaloniki , Greece (neurosurgery, dialysis and intensive care burn units). Greek ambulances and mobile medical teams are sent towards the other side of the blocked tunnel to assist their colleagues from Sandanski /Petrich and provide triage and on site medical care for the entrapped injured people. NGO and Red Cross volunteers are mobilized to take care of the uninjured and slightly people escaping the scene of the incident, and a reception and information center is set up for psychosocial care of the persons affected and to inform the families of persons involved and the general public. Secondary transport by air ambulances is organized for patients in the nearby hospitals to be transferred to more specialized larger hospitals.

What can be tested for the purposes of IMPRESS:

- critical decision points, analysis and categorization of the health needs, analysis of patient flow, communication, reporting and exchange of information, protocols and procedures for decision making in the dispatching center, the advanced medical post (e.g. START system of Simple Triage and Rapid Treatment), the crisis centers and especially in the different hospitals involved (e.g. the mass casualty incident protocol which they initiate as soon as they are notified, in order to organize a capacity surge, including calling in more staff, pulling extra and spare equipment out of storage, and clearing non-acute patients out of the hospital)
- the focus will be on the health services and not on interdisciplinary coordination between health services and the rescue/fire and police operations

This scenario is the working scenario where IMPRESS system after its development in the end of the second year of the project life time has to show to its stakeholders what additional functions can bring to stakeholders responding in the

described scenario. Further refinements and validations throught the proposed cross-border scenario may occur during the implementation phase of the tests and validations of the system.

CONCLUSIONS

This paper describes the identified gaps between the different actors in the cases of mass emergencies and their limitations in response provision. With our paper we outlined the most relevant interdisciplinary ideas which with the implementation of the nowadays GIS, ICT and medical technologies can bring to a better, faster and safer outcome in cases where many casualties are injured and need medical help. The described cross-border test scenario is giving the option to the reader what capacity the system architecture can give to the first responders in cases of emergency situation.

ACKNOWLEDGEMENT

This work has been partially funded by the EC in the 7th Framework Programme, (SEC-2013.4.1-4: Development of decision support tools for improving preparedness and response of Health Services involved in emergency situations) under grant number FP7-SEC-2013 – 608078 - IMproving Preparedness and Response of HEalth Services in major criseS (IMPRESS).

REFERENCES

[1] Graves, R. (2004) Key Technologies for Emergency Response, Proceedings of ISCRAM2004, Brussels, Belgium, 133-138.

[2] ARGOS Decision Support for Emergency Management, in http://www.pdc.dk/argos.

[3] Computer-Aided Management of Emergency Operations (CAMEO), in http://www.epa.gov/emergencies/content/cameo/index.htm

[4] DGI's CoBRA decision-support toolset for crisis response, in http://www.defensegroupinc.com/cobra/index.cfm.

[5] MAEviz, in http://mae.cee.illinois.edu/software_and_tools/maeviz.html.

[6] Gill JM. Page GG. Psychiatric and physical health ramifications of traumatic events in women. Issues Ment. Health Nurs. 2006;27:711–734.

[7] Mileti, D.S. (1999). Disasters by Design, A Reassessment of Natural Hazards in the United States. Washington, D.C., John Henry Press.

[7] http://www.novinite.com/articles/139607/7+Seismic+Spots+in+Bulgaria+Can+Cause+Earthquakes+beyond+6.5.

BIOGRAPHY

Nina Dobrinkova, PhD in Infomatics, working in department Communication Systems and Services in the Institute of Information and Communication Technologies, responsible for IMPRESS project implementation on the Bulgarian side of the test case cross-border scenario. Having preveious experience with other civil protection oriented projects and participant in the international field test excersise EVROS2010 organized by the Civil protection financial instrument of DG ECHO.

PhD Geert Seynaeve is the leader of the international consortia partner ECOMED, who has provided all his valuable knowledge to the Bulgarian team to develop and prepare on first phase the cross-border scenario implementation for the test case in the IMPRESS Platform.

Mr. Asen Slavev and Mrs. Andriana Zlatkova are technical support team of PhD Nina Dobrinkova in IICT-BAS helping and supporting her work for data collection and validation according to the IMPRESS Platform reqirements.